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THESIS

AN EVALUATION OF THE SELECTED RESERVE EDUCATIONAL ASSISTANCE PROGRAM (SREAP) AS IT RELATES TO THE SELECTED MARINE CORPS RESERVE (SMCR)

by

John D. Gumbel

September 1987

Thesis Advisor: Loren Solnick

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An Evaluation of the Selected Reserve Educational Assistance Program (SREAP) as it relates to the Selected Marine Corps Reserve (SMCR).

by

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Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

The Selected Reserve Educational Assistance Program, which became effective on 1 July 1985, is the first educational assistance program to provide specifically for members of the Selected Reserve. This thesis reviews previous veterans educational assistance programs and evaluates the impact of the Selected Reserve Educational Assistance Program, through its first twenty-two months of existence (1 July 85 - 30 April 87), on Selected Marine Corps Reserve attrition. For several samples program participants are found to have significantly lower attrition rates. These lower attrition rates are translated into a financial analysis that demonstrates the program to be highly cost effective in its successful attainment of its stated goal of increased retention in the Selected Reserves.

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I. INTRODUCTION

Since World War II Congress has enacted a succession of educational assistance programs for veterans. Until the passage of Public Law 98-525, "Veterans Educational Assistance Act of 1984", sections 705 and 706, no educational benefits had been specifically provided for members of the Selected Reserve. This act provided specific procedures for the educational assistance program for members of the Selected Reserve as authorized in and amending Chapter 106 of Title 10, United States Code, thus establishing the Selected Reserve Educational Assistance Program (SREAP) as a part of the New GI Bill [Ref. 1]. The New GI Bill, which started as a temporary program on 1 July 1985, became permanent on 1 June 1987 as the Montgomery Educational Assistance Act of 1984.

The Selected Marine Corps Reserve (SMCR), a category of the Ready Reserve, which is in turn a category of the Marine Corps Reserve, consists of those individuals and units who train in peacetime for immediate mobilization. These are the individuals and units generally thought of in discussion of reserves and are distinguished by their weekend drills and annual two week active duty training periods. The preponderance of the SMCR consists of the 4th Marine Division, the 4th Marine Aircraft Wing, and the 4th Force Service Support Group. [Ref. 2] The Marine Corps Reserve represents 25% of the total peacetime combat power of the Marine Corps and 33% of the trained manpower [Refs. 3;4].

As of 1 March 1986 the Marine Corps Reserve occupied 186 Reserve Centers located in 46 states, the District of Columbia, and Puerto Rico. The FY 86 end strength of the SMCR was 41,582 [Ref. 5].

A. PURPOSE

The purpose of this thesis is to evaluate the Selected Reserve Educational Assistance Program through its first twenty-two months of existence (1 July 85 - 30 April 87) as it relates to the Selected Marine Corps Reserve. Toward that end, this thesis will describe SREAP and examine its effect on retention among members of the SMCR. Specifically, the effect of using SREAP benefits on an individual's propensity to attrite from the SMCR will be examined using a logit multiple regression model.

B. SCOPE AND LIMITATIONS

This thesis discusses the Selected Reserve Educational Assistance Program portion of the New GI Bill, which, in the case of Marine Corps Reserve, is applicable only to members of the Selected Marine Corps Reserve. To that effect this thesis will focus on the members of the SMCR who are or could be eligible for participation in SREAP.

Since the program has existed only since 1 July 1985, this paper will concentrate on data gathered from that date up until 30 April 1987. Because of the relative lack of maturity of the program and accompanying data, as compared to data available for previous educational assistance programs, this paper will mainly concern itself with the impact that SREAP has had upon retention among the eligible SMCR population. This impact will be determined by data made available by the Defense Manpower Data Center (DMDC), and Marine Corps Reserve statistics.

C. ISSUE

SREAP is intended to encourage membership in and increase retention among those reserve forces eligible for the program. Increased retention is meant to lower manpower training and recruiting costs by reducing the requirement for accessions. The result should be a better trained, more

effective fighting force at a lower overall cost. Litterer states that, "What is demanded in the way of obedience must be seen as adequately compensated by the reward" [Ref. 6:430]. Congress is attempting to motivate the commitment (six years in the case of SREAP) of prospective and current members of the concerned organizations (the SMCR in this case) by enhancing the capabilities of the reward system. The issue is whether or not the $2,254,042.00 [Ref. 7] spent on SREAP as of 30 April 1987 for members of the SMCR had accomplished the objective of the program.

D. LITERATURE REVIEW

The background material and data for this study was compiled from three major sources:

1. An extensive literature review that focused on previous educational assistance programs.
2. DMDC databases including the Reserve Components Common Personnel Data System (RCCPDS) and the New GI Bill (NGIB) Database.
3. Telephone and personal interviews conducted with officials of Headquarters Marine Corps Reserve Affairs Branch, DMDC, the Center for Naval Analysis, the Research, Studies, and Evaluation Division of the U.S. Army Recruiting Command and the Veterans Administration.

Initial literature reviews that focused on the New GI Bill and educational assistance to selected reservists proved relatively fruitless because of the lack of literature on the topic owing to its newness. A conversation with Juri Toomepuu, Department of the Army Civilian Chief, Research, Studies and Evaluation Division, U.S. Army Recruiting Command, confirmed this finding. Mr. Toomepuu attributed the minimal amount of literature available on the New GI Bill to the age of the program. He attributed the total lack of studies on SREAP portion of the bill to the emphasis that had been placed on the active duty portion of the bill in support of Congressional

decision making in the process of changing the Veterans Educational Assistance Act of 1984 from a temporary program to a permanent one. The program became permanent in May 1987.

Mr. Toomepuu, in his "Focus on Quality" [Ref. 8] briefing, discusses the cost effectiveness of the New GI Bill in attracting quality recruits to the active duty Army. Because of time constraints in performing research, and because of the large dollar value of the active forces possible benefits under the bill as compared to the reserve forces, the actives were of primary concern to Mr. Toomepuu as he undertook analysis in support of the Congressional battle to make the New GI Bill legislation permanent. Through a series of statistical analyses Mr. Toomepuu concluded that educational incentives are cost-effective for recruiting, and even better from the larger prospective of force quality and post-service human capital and earnings. His briefing included an adaptation from a report by T. Daymont and P. Andrisani entitled, "The Economic Returns to Military Service" (Temple University, November, 1986), which showed that veterans who earned college degrees earned 34.8% more than non-college veterans at a point 19 years after high school. The effect of college education on earnings differentials is supported by studies of human capital theory [Ref. 9]. Mr. Toomepuu also stated that the Senate Veterans' Affairs Committee found that "for each dollar spent on educational benefits....the federal government has received from $3 to $8 in additional revenues from veterans."

Multiple searches of research databases did result in a good deal of literature on previous GI Bills. These papers and books studied many of the aspects of educational assistance including the human resource economics, the effects on attracting more high-aptitude high school graduates, the accounting methods used in costing for the programs, and others.

In their 1977 "Reserve Component Attitude Survey" (RCAS) [Refs. 10;11], Associates for Research in Behavior, Inc., analyzed the results of

their survey of 6,965 men, 3,961 of whom were current members of the National Guard or Reserve. In section 3.3.5, "Reactions to Possible Benefits by Current Reservists", the researchers analyzed the reactions of the Army National Guard (ARNG) sample to various levels of educational assistance in terms of the respondents propensity to reenlist in the ARNG. The researchers found that 44.3% of the sample responded favorably in their propensity to reenlist at a 25% cost of education paid benefit level, 61.2% at the 50% level, 71.2% at the 75% level, and 75.4% at the 100% level. [Ref. 10:43]

The 1982 RCAS, which was the fifth of the annual series, did not analyze the attitudes of current members of the National Guard or Reserve, but instead focused on non-prior service and prior service men and women, and items that affected their propensity to join the Guard or Reserves. RCAS data from 1979 to 1982 is contained in Reference 12. In analyzing that data, it appears that educational benefit incentives would, as expected, increase the respondent's propensity to enlist as the level of educational benefits increased. [Ref. 12:N-1-16]

The Rand Study "Issues in the Use of Postservice Educational Benefits as Enlistment Incentives" [Ref. 13:50] addressed the issue of a GI Bill's effect on retention. That study indicated the adverse effects a post-service educational assistance program (the Veterans' Educational Assistance Program, VEAP) could have on retention. It referenced a 1975 Human Resources Research Organization study [Ref. 14] that concluded that the Vietnam Era GI Bill had an adverse effect on retention among those individuals who gave GI Bill benefits as their primary reason for their decision to enlist. It should be noted that SREAP is not a post-service educational program, and in fact is the first GI Bill educational benefits program that can be used only while the individual is still in the military.

Only two of the studies, references 15 and 16, dealt directly with the latest GI Bill, with only Reference 16 mentioning the Selected Reserve Educational Assistance Program in its discussions. In his "The New G.I. Educational Assistance Bill: A Case Study in Bureaucratic Politics" [Ref. 15], Col. Harris examines the processes behind the passage of the New GI Bill legislation in an attempt to improve our understanding of the federal policymaking process. The paper is a case study of how the New GI Bill, as a part of the Department of Defense Authorization Act, 1985, became law. Col. Harris ends by identifying four lessons he feels can improve Department of Defense military and civilian representatives' effectiveness with Congress.

In their "Mobilization Studies Program Report: The Efficacy of the Latest GI Bill" [Ref. 16], LTC.'s Boegler and Ferry and CDR. Fischer examine the efficacy of the latest GI Bill vis-a-vis past GI Bills and other education and training benefit programs. Special consideration is given to analysis of the impact of the latest GI Bill on mobilization. The authors concluded in their March 1985 report that the mobilization status of the 1 July 1985 GI Bill would have to be addressed and in addition, the Bill:

- Would hold little promise of doing more than the previous effort, the Veterans' Educational Assistance Program, in terms of recruitment and retention of quality manpower for the Armed Services.
- Would cost more than VEAP.
- Would do little to maintain or enhance the current status of manpower mobilization.

The authors' mention of the of the educational benefits to the Selected Reserve is in a reference to the New GI Bill's recognition of the Selected Reserve as part of the Total Force concept by their inclusion in the bill in the form of SREAP. Basically, the Total-Force policy, which was promulgated in 1973 by Secretary of Defense James Schlesinger, integrates the National Guard and Reserve with the active force along several dimensions including

force structuring, mobilization planning, and operational evaluation [Ref. 2:1].

E. SUMMARY OF FINDINGS

Logistic regression performed for the statistical analyses used in this study showed SREAP to have a significant negative effect on the probability of an individual being considered as a voluntary loss as defined within the context of this study. The resultant high positive marginal effectiveness of SREAP on retention in the SMCR is translated into a financial analysis that demonstrates SREAP to be highly cost effective in its successful attainment of its stated goal of increased retention in the Selected Reserves.

II. BACKGROUND

This chapter reviews the previous GI Bills, the 1981 educational assistance test programs, and the New GI Bill. The first two GI Bills, WWII and Korean War, provided educational and other benefits for veterans after their separation from the military. Starting with the post-Korean or Cold War GI Bill the serviceman could use his benefits while still in the service. In the latest GI Bill, the SREAP portion of the Bill is unique in that it provides educational benefits specifically for Reserve forces. Because SREAP can only be used while the individual is currently a member of the Selected Reserve, it has become a factor in retention that has no comparison with the two oldest GI Bills, and little comparison with the third through fifth GI Bills.

A. PREVIOUS GI BILLS

1. WWII GI Bill

The first GI Bill began with the passage of the Serviceman's Readjustment Act of June 22, 1944 [Ref. 17]. The bill covered those who served in the military between 16 September 1940 and 25 July 1947 and consisted of payments directly to the educational institution not to exceed $500 per school year for books, tuition, and fees. Veterans also received $50 per month for subsistence which was increased to $75 per month by 1948. Benefits to veterans were curtailed if their income rose above $175, absent dependents, or $200 with dependents. This limit also rose in 1948 to $210, absent dependents, $270 for one dependent, and $290 for two or more dependents. The bill allowed for a minimum of one year of training plus one

month for each month of active duty up to a maximum of 48 months. [Refs. 18;19]

Seven million eight hundred thousand veterans were trained under the WWII GI Bill, representing more than 50% of the veteran population, at a total expenditure of $14,526,100,000 [Ref. 20]. Veterans were required to begin their training within four years after discharge from the service and could draw benefits up to nine years after discharge [Ref. 19]. The program ended in 1956 [Refs. 17;18].

2. Korean War GI Bill

The Korean Conflict GI Bill legislation became effective 20 August 1952 and covered service during the period 27 June 1950 and 31 January 1955 with payments under the program terminating on 31 January 1965 [Ref. 21]. Under the Korean Conflict GI Bill the provision for direct payment to the educational institution was eliminated and in its place an "educational assistance" allowance to meet in part the combination of living and educational expenses was substituted. The monthly allowances under this bill were $110 for a full time student without dependents, $135 one dependent, and $160 more than one dependent. The bill provided for benefits at the rate of one and one-half times active duty time to a maximum of 36 months. The veteran had to begin training within three years after discharge and had up to eight years after discharge to complete. [Refs. 18;19]

Two million three hundred ninety-one thousand veterans representing 43% of the Korean War era veterans were trained under the Korean War GI Bill at a cost of $4,521,400,000 [Refs. 18;20].

3. Post-Korean War and Vietnam Veterans' GI Bill

The post-Korean or Cold War GI Bill became effective on 1 June 1966 as Public Law 358, 89th Congress. It was a permanent GI Bill applying to service after 1 February 1955. The bill originally provided an educational assistance allowance of $100 per month with a maximum of 36 months of

eligibility earned at the same one and one-half rate as the previous bill. Differences from the previous bill included that the maximum entitlement was attainable with only eighteen months of service and that members could now use their benefits while still in the service after serving a minimum of 181 days. By 1972 the educational assistance allowances had increased to $220 per month, no dependents, $261, one dependent, $298, two dependents and $18 per month for each additional dependent. Benefits under this program were generally required to be used by the veteran with in 10 years after his discharge. [Refs. 18;19]

The Vietnam Veterans' Readjustment Act of 1974, Public Law 508, 93rd Congress, 38 USC Chapter 34, was essentially a continuation of the existing GI Bill for those who had served at least 180 days between 31 January 1955, and 1 January 1977 [Refs. 16;21]. Additionally, individuals who had obligated themselves for service before 1 January 1977, and went on active duty in 1977, with the exception of service academy graduates, were eligible for the Vietnam Era GI Bill. With periodic increases, by 1987 the benefits had reached $376 per month, no dependents, $448, one dependent, $510, two dependents, and $32 per month for each additional dependent [Ref. 22]. Veterans discharged after 1 June 1966 qualifying under this bill have ten years after their last discharge or release or until 31 December 1989, whichever is earlier, to use their benefits. Benefits under this bill were accrued at a rate of one and one-half months for month of active service up to a maximum of 45 months [Ref. 22].

An estimated 6.6 million of the 9.1 million veterans eligible for the Vietnam Era GI Bill have participated in training along with 1.4 million veterans from the Post-Korean era. Of these 8 million, approximately 4.9 million attended institutions of higher learning; 2.5 million attended vocational training or on-the-job training; and 56,000 participated in farm-training programs. [Ref. 16]

4. Veterans' Educational Assistance Program (VEAP)

The Vietnam GI Bill was replaced by the Post-Vietnam Era Educational Assistance Program through the Veterans' Education and Employment Assistance Act of 1976, Public Law 94-502, 38 USC Chapter 32, which stated that:

It is the purpose of this chapter to:

1. Provide educational assistance to those men and women who enter the Armed Forces after December 31, 1976,
2. Assist young men and women in obtaining an education they might not otherwise be able to afford and,
3. Provide and assist the all-volunteer military program of the United States by attracting qualified men and women to serve in the Armed Forces. [Ref. 16]

Unlike previous programs, VEAP is a contributory program in which the serviceman who opts to participate must contribute as a condition of entitlement. Members who entered the service on or between 1 January 1977 and 30 June 1985, and were eligible for the program could voluntarily contribute from $25 to $100 per month to a maximum of $2700 which would be matched on a 2-for-1 basis for a maximum government contribution of $5400. This $8100 total would then be paid out at the rate of one month of educational assistance for each month of contribution to a maximum of 36 months of benefits. A later change allowed the service member to contribute up to the maximum contribution in the form of a lump-sum payment. [Ref. 21:19] After the first year of the program enlisted participation rates within each service were 20.4% Army, 19.9% Navy, 7.9% Marine Corps and 1.0% Air Force. Officers represented less than one-half of one percent of all VEAP participants. [Ref. 23:iv] By 1985 utilization rates of the program were still relatively low as demonstrated in the Army where only one in four recruits signed up for the program and the majority of these soldiers never completed the program. The VA indicated that only 7 to 8 percent of all

eligible service members receive benefits. [Ref. 16:15] Marine Corps records show that there were over 330,000 active duty accessions during the period of VEAP eligibility. VA data as of 30 June 1987 indicates 152,268 Marines had contributed into the program and that 15,234 have actually trained under the program for 10% of the contributors and less than 5% of the accession population. There are 25,525 Marines currently contributing to the program.

Because of difficulty in recruiting the necessary numbers to fill its force structure, the Army was first authorized in FY 1979 to offer a supplemental educational bonus called a "Kicker". Relatively modest at first, by 1985 the kicker, which the Army advertised as the Army College Fund (ACF), had reached $14,400, $12,000, or $8000 for a four-, three-, or two-year enlistment [Ref. 16]. The kicker has contributed substantially to number of quality accessions the Army has enlisted by attracting more college oriented individuals. From 1980 to 1986 non-prior service accessions with high school diplomas rose from 54% to 91% while those in Armed Forces Qualification Test (AFQT) Category I-IIIA rose from 25% to 63% [Ref. 8].

5. The 1981 Educational Assistance Test Programs

Because of disappointing recruiting results in the years following the introduction of VEAP, which resulted in Congressional concern over attracting and retaining quality recruits, an educational assistance test program was written into the 1981 Defense Authorization Act. The purpose of the test program was to determine the educational assistance program or mix of programs that would best attract more high-aptitude high school graduates into military service. [Ref. 24:iii,v]

Three tests and a control program were developed, one test for each of three interested parties. These tests were:

- The control program consisting of basic contributory VEAP in all services and kickers of up to $6000 for qualifying Army enlistees.

- From the Army, *Ultra-VEAP*, which was identical to the control program, except army kickers were raised to a maximum of $12,000.
- From the Senate Armed Services Committee, a *noncontributory VEAP program*, in which the DoD paid the qualified enlistees' contribution to VEAP and the Army had kickers up to $6000.
- From the House of Representatives, a noncontributory *Tuition/Stipend program*, in which qualified enlistees received $1200/year in tuition assistance and a subsistence allowance of $300/month for up to four academic years, both indexed for inflation. Optionally, benefits could be transferred to dependents or cashed out upon reenlistment. [Ref. 24:vi]

The tests were to run from 1 December 1980 through 30 September 1981, each in a set of geographically dispersed area of the country. The results of the tests were published and analyzed in a Rand Corporation report for the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics) entitled "Enlistment Effects and Policy Implications of the Educational Test Program" [Ref. 24]. The Marine Corps conducted their tests in a different manner than the other services and those results were not included in the Rand study. In the study, comparisons were made of gains of accessions of high-quality male enlistments in the test cells over the control cell, between a base period (December 1979-September 1980) and the test period (December 1980- September 1981).

The study showed that each of the test programs increased enlistments of high-quality males in at least one of the services. Army enlistments were raised 9% by their Ultra-VEAP kicker program which did not, at the same time, hurt Navy and Air Force recruiting. The Air Force was the only service to have a statistically significant increase (5%) from the Noncontributory VEAP program even though it was offered by all the services. Navy and Air Force enlistments increased 10% and 8%, respectively, as a result of the Tuition/Stipend program while the Army showed a decrease of 6% from this program. [Ref. 24:vii]

The Rand report stated that the test results had the following implications for future policy:

- Give serious consideration to retaining a contribution requirement. While reducing costs, it does not discourage enlistments.
- Skill targeting should be used as an additional means for limiting program costs. A targeted program can channel benefit-attracted enlistees into hard-to-fill specialties, but more important from a cost standpoint, it ensures that most of the program dollars spent go to those enlistees with the greatest commitment to pursuing further education.
- In the design of a new program, the special problems faced by the Army should be recognized.

In summary, the Rand study concluded that the Educational Assistance Test Program showed that a contributory, targeted program would be more cost effective than a general entitlement. [Ref. 24:viii]

B. THE NEW GI BILL

The New GI Bill, originally entitled "The Veterans' Educational Assistance Act of 1984," started as a three year temporary program on 1 July 1985, and became a permanent program entitled "The Montgomery Educational Assistance Act of 1984," on 1 June 1987. As the latter title would indicate, Representative G.V. "Sonny" Montgomery played no small role in the programs existence.

Representative Montgomery's draft of the House's first version of the Veterans' Educational Assistance Act of 1981 (H.R. 1400) was an attempt to solve recruiting and retention problems of the military through the employment of education incentives. Initially supported by the Administration (President Reagan had stated twice during his 1980 campaign that he would ask Congress to reinstate the GI Bill), this support was withdrawn when a poor economy caused recruiting and retention to improve. Representative Montgomery, leading a coalition of members of the

House, believed that the recruiting and retention improvements were only temporary and legislation to prevent a recurrence of manpower problems was necessary. Representative Montgomery's efforts finally resulted in an amended Department of Defense Authorization Act, 1985, that included his military educational assistance program. [Ref. 15]

The Montgomery GI Bill, as Title 38 USC, Chapter 30, states its purpose as:

1. To provide a new educational assistance program to assist in the readjustment of members of the Armed Forces to civilian life after their separation from military service;
2. To promote and assist the All-Volunteer Force program and the Total Force Concept of the Armed Forces by establishing a new program of educational assistance based upon service on active duty or a combination of service on active duty and in the Selected Reserve (including the National Guard) to aid in the recruitment and retention of highly qualified personnel for both the active and reserve components of the Armed Forces; and
3. To give special emphasis to providing educational assistance benefits to aid in the retention of personnel in the Armed Forces. [Ref. 1]

1. The Active Program (TITLE 38 USC CHAPTER 30)

An individual is entitled to basic educational assistance under the bill if he or she:

1. Enters on active duty after 1 July 1985.
2. a. Serves at least 36 months continuous active duty or at least 24 months of an initial term of less than 36 months or separates for a service connected disability or hardship or

   b. Serves at least 24 months on active duty followed by 48 months of satisfactory service in the selected reserve or separates for a service connected disability or hardship.
3. Receives a secondary school diploma or equivalent certification before completion of the service requirement.
4. Continues on active duty or separates with an honorable discharge.

5. Has allowed his or her base pay to be reduced by $100 a month for 12 months.

An individual who qualifies under the program as described in 2.a. above is entitled to the basic educational assistance allowance of $300 per month for full-time assistance or equivalent part-time assistance, unless his or her initial term of service is 24 months, in which case he or she is entitled to $250 per month. An individual who qualifies under section 2.b. above is entitled to 1 month of assistance for each month of active service and 1 month for each 4 months of Selected Reserve service, not to exceed 36 months of full-time assistance or the equivalent part-time assistance. The basic educational assistance allowance may be increased by up to $400 per month as a recruiting incentive for those skills for which a shortage exists or for which it is difficult to recruit.

There are special provisions under the New GI Bill to accommodate those servicemen who qualify for the Vietnam Era GI Bill, Title 38 Chapter 34 (which expires on 31 December 1989). If these individuals served on active duty for at least 36 months after 30 June 1985 (or 24 months active and 48 months Selected Reserve) they qualify after 31 December 1989 for one and one-half times whatever amount they would qualify for under the New GI Bill for a period equal to whatever length they would have qualified for under the Vietnam Era GI Bill. A detailed explanation of the requirements and benefits for active duty personnel under the New GI Bill is found in Title 38 USC Chapter 30.

It is interesting to note that those officers who were commissioned via a service academy or ROTC scholarship program after 31 December 1976 are not eligible for the Montgomery GI Bill. Those who came on active duty between 31 December 1976 and 1 July 1985 were eligible for participation in VEAP, except for the 1977 scholarship ROTC graduates, who qualified for the Vietnam Era GI Bill. Individuals who qualify for more

than one of the programs discussed in this study may receive benefits under the one program they choose [Ref. 1].

2. The Selected Reserve Educational Assistance Program (TITLE 10 USC CHAPTER 106)

The focus of this study is on SREAP. As contained in Chapter 106 of Title 10 USC, SREAP is a noncontributory program that provides $140/month for 36 months of full-time study, $105/month for 48 months of 3/4 time study, or $70/month for 72 months of 1/2 time study in the pursuit of a baccalaureate degree.

To be eligible for SREAP, the SMCR Marine must:

- enlist/reenlist/extend for a total SMCR obligation of 6 years on or after 1 July 1985.
- have a high school diploma or GED before completing Initial Active Duty for Training (IADT).
- have completed at least the 1st increment of IADT and have 180 days in the SMCR.

Benefits paid under this program are contingent upon continued satisfactory service in the SMCR for the period of obligation. Failure in this respect may result in being required to repay monies received or be processed as an unsatisfactory participant and ordered to active duty for two years (less any active duty already served).

Individuals in the SMCR who are ineligible for SREAP include:

- those possessing a baccalaureate or equivalent degree.
- those currently receiving VA educational benefits.
- those commissioned at a service academy or through an ROTC or NROTC scholarship program.
- those receiving financial assistance from an ROTC or NROTC scholarship program.

SREAP is funded by the Defense Education Benefits Fund which is administered by the Secretary of the Treasury. The fund operates on an

accrual basis. The Department of Defense is required to deposit the present value of the future benefits payable from the fund. Amounts paid into the fund are paid from appropriations for military pay that are under the jurisdiction of the service Secretaries. [Ref. 1] As of 30 April 1987 2580 Marines had drawn benefits under SREAP totaling $2,254,042. Further statistical analyses of SREAP and the SMCR are contained in Chapter IV, Analysis.

III. METHODOLOGY

A. OVERVIEW

The data file relevant to this study is entitled "New GI Bill Database." The database was provided by the Defense Manpower Data Center located in Monterey, CA (DMDC West). The NGIB Database is a combination of extracts from the Reserve Components Common Personnel Data System, VA input, and, in the case of the Marine Reserve and Coast Guard Reserve, specific NGIB inputs. The NGIB Database was established under DoD Instruction 1322.7, 26 June 1985 [Ref. 25], and contains records on all individuals who are or have been on active or reserve duty during the period starting 1 July 1985.

The version of the NGIB extract used in this study is number 45, which is updated with Selected Reserve information through April '87 and VA data through May '87. Versions are numbered in sequence as they occur, irrespective of the time frame the update encompasses. Version 45 has 66,535 Selected Marine Corps Reserve records and indicates that 2580 individuals of the SMCR have participated in the Selected Reserve Educational Assistance Program with benefit payments ranging from $23 to $3468. The end strength of the SMCR as of 30 April 1987 was 41,377.

B. RELEVANT ELEMENTS OF THE NGIB DATABASE

The NGIB Database contains 69 data fields which are applicable to Selected Reserve forces, active forces, or both. For the purpose of this study, the DMDC created an extract of SMCR records containing 28 of the fields in

the database relevant to the SMCR. The following table lists the 14 elements of the NGIB Database actually used in the study.

TABLE 1.
RELEVANT ELEMENTS OF THE NGIB DATABASE

Social Security Number	Sex
Race/Ethnic Category	File Date
File Type	Marital Status
Civilian Education	Total Benefits Paid
Armed Forces Qualification Test Category	Eligibility Status
Separation Program Designator	Date Separation/Transfer
Interservice Separation Code	Pay Grade

Social Security Number (SSAN) was used to perform record matches with the 30 April 1987 RCCPDS Master File and the 30 April 1987 Active Master File. The purpose of the match was to determine if, as of 30 April 1987, the individual was a loss to the SMCR due to transfer to another service's branch of Selected Reserves or to a branch of the Active forces. If the individual was on active duty, in another Selected Reserve force, or had retired from the military, a code to that effect was appended to the individual's record on the database extract. There are no SSAN duplicates within the SMCR portion of the database.

Race/Ethnic Category, Sex, Marital Status, Civilian Education, AFQT Category, and Pay Grade were included for use as independent variables in statistical analysis. Race/Ethnic Categories in the database are White, Black, Hispanic, American Indian/Alaskan Native, Asian/Pacific Islander, and Other. Marital Status Codes are Single, Married, No longer married, and Unknown.

There are 21 Civilian Education Codes (Educational Certification Codes) indicating educational levels from less than a high school diploma to a doctorate level degree. The relevant education categories for the purpose of this study were those that would be eligible for participation in SREAP as indicated in Chapter II of this study. These relevant categories are: 04 Test-based equivalency diploma; 05 Occupational program certificate of completion; 06 Occupational program certificate; 09 High school certificate of attendance; 15 High school diploma; 20 First year college level of education certificate equivalency; 21 Associate degree and; 22 Professional nursing diploma. These educational categories contain 92% of all E1 - E6's (not coded as civilian education unknown) in the SMCR extract of the NGIB Database.

Armed Forces Qualification Test Category comes from the intelligence and aptitude testing that is done to determine eligibility for enlistment through the Armed Services Vocational Aptitude Battery (ASVAB). The ASVAB consists of ten subtests covering Arithmetic Reasoning, Word Knowledge, Paragraph Comprehension, Numerical Operations, General Science, Coding Speed, Auto and Shop Information, Mathematics Knowledge, Mechanical Comprehension, and Electronics Information. The first four subtests listed above are combined into a single index of trainability called the AFQT, which is used to determine basic eligibility for military service and eligibility for certain occupational fields [Ref. 26:14]. AFQT scores are divided into five categories that represent levels of trainability from Category I, very high trainability, to Category V, very low trainability. The Marine Corps currently accepts only men with scores of 31 or higher on the AFQT and women with scores of 50 or higher.

TABLE 2.

AFQT CATEGORIES

NGIB AFQT category	AFQT category	AFQT percentile score	Reading grade level
00	unknown		
01	V	9 and below	3.4-6.5
02	IVC		
03	IVB		
04	IVA		
05	IV	10-30	6.6- 8.0
06	IIIB		
07	IIIA		
08	III	31-64	8.1- 10.5
09	II	65-92	10.6- 12.6
10	I	93-99	12.7- 12.9

File Date indicates the last time that particular record was updated. File Type is coded as an 'M', 'P', or 'L'. An 'M' indicates that the individual is on the RCCPDS master file as a current member of the SMCR, an 'L' indicates a loss, and a 'P' indicates a presumed loss. Eligibility Status is a two digit numeric code indicating whether the branch of the Selected Reserve considers the individual to be eligible or not eligible for SREAP and the basis for assignment of that status. Qualifications for eligibility are described in Chapter I of the study, but basically they are possession of the appropriate civilian education and a 6 year SMCR commitment after 30 June 1985.

Separation Program Designators (SPD) are three letter codes used to indicate reason for separation from the military. The Marine Corps uses a fourth numeric character for further clarification in the SPD that is not contained in the NGIB Database. Interservice Separation Codes are three

digit numeric codes that provide separation data parallel to the information in the SPD's.

Pay Grade is a two digit code indicating rank from E1 to O10. Total Benefits Paid are whole dollar figures from $0 to $3468 (current high benefit). Non-zero benefits paid are used in the analysis to indicate participation in SREAP. Date of Separation/Transfer is used to eliminate from the study those individuals who separated prior to 30 September 85, which is the date the Marine Corps published its instructions for the implementation of SREAP [Ref. 27].

C. CONSTRUCTION OF THE DATABASE EXTRACT

In order to develop an appropriate database extract for this analysis these steps were taken: (1) limit the file to SMCR records only, (2) include only those Marines potentially affected by SREAP, (3) clean up the losses as much as possible within the confines of the available data to reflect voluntary departure from the SMCR by (a) eliminating those individuals whose departure from the SMCR was not voluntary (death, medical discharges, etc.) or due to retirement and by (b) eliminating those individuals who were kicked out, except those kicked out for failure to participate, and , (4) eliminate those records with missing data important to the conduct of this study. An individual's failure to participate was considered to be voluntary departure from the SMCR for the purposes of this study, with the exception of those individuals who ended up on active duty as a result thereof.

The database extract was first limited to SMCR records by selection on the Component Code representing the Selected Marine Corps Reserve (66,535 records). The extract was further limited by including those pay grades most affected by SREAP. For that reason, only Pay Grades E1 through E6 representing 89.3% (59,448) of the records and 99.63% (2570) of the SREAP users were included. Only those with the eligible Civilian

Education Codes (04, 05, 06, 09, 15, 20, 21 or 22) were included. Individuals who separated from the SMCR prior to Marine Corps publication of SREAP (30 September 85) were eliminated from the database. There were 11,488 AFQT '0' (AFQT unknown) records that were eliminated at those points when AFQT was considered in the analysis.

If the records were coded as File Type 'L', loss, or 'P', presumed loss, they were included only if their corresponding Interservice Separation Code was one listed the following table. Other codes that would have been eligible for inclusion in the database extract are omitted from this list because no SMCR E1 - E6 records were coded as such.

Records coded as losses or presumed losses with Interservice Separation Codes or Separation Program Designators that indicated that the individual separated from the SMCR for retirement, death, medical discharge or retirement, misconduct, drugs, civil convictions, unsatisfactory performance, homosexuality, fraudulent entry, erroneous enlistment, entry-level performance or conduct, hardship, pregnancy, or other codes that would indicate that separation was in the best interest of the SMCR or less than voluntary, were eliminated from the study.

It is important to note that of the total 15,187 E1 - E6 records coded as losses or presumed losses (after 30 September 1985), with AFQT other than 0, and also coded with one of the eligible Civilian Education Codes, and in addition not retired, only 8910 of these contained Interservice Separation Codes, Separation Program Designators, were coded as active duty or in another branch of Selected Reserves (as of 30 April 1987), or contained some combination of the above codes. Data-quality problems such as these missing codes and unknown AFQT's are common in dealing with reserve data.

TABLE 3.
INCLUDED INTERSERVICE SEPARATION AND SPD CODES

INTERSERVICE SEPARATION CODES

0	None
001	Expiration of Term of Service
002	Early Release - Insufficient Retainability
003	Early Release - To Attend School
040	Officer Commissioning Program
042	Service Academy
100	Immediate Reenlistment

SEPARATION PROGRAM DESIGNATORS

Blank	No SPD
GSK	Failure to Participate
HSK	Failure to Participate
JSK	Failure to Participate
KBK	Expiration of Enlistment
KGN	Commissioned or Transferred to Another Branch
KHC	Immediate Reenlistment
MBK	Completion of Required Service
MGU	Service Academy
VBK	Completion of Required Service

D. CODING OF VARIABLES FOR STATISTICAL ANALYSIS

As stated earlier, all variables in the study used in the statistical analysis, with the exception of AFQT, were binary coded. In each case a '1' was used in the binary coding to indicate the presence of the associated attribute and a '0' to indicate absence. Pay Grade was split into the six different grades, E1

through E6. Sex was split into male and female. Marital Status was divided into Single, Married, or Formerly Married.

Each of the Civilian Education Categories was given an individual variable, with the exception of Codes 05 and 06 (Occupational program certificate of completion and Occupational program certificate, respectively), which were combined into a single variable (gradee56). Race/Ethnic Categories were each given an individual variable, with the exception of the American Indian/Alaskan Native Category, which because of its small sample size (118) was combined with the Race-Other Category. AFQT was treated as a discrete variable with values ranging from 1 to 10.

The most important variable to the study is benefits paid. Benefits paid was coded as a '0' or '1', with '0' representing no benefits having been paid to the individual under SREAP as of 30 April 1987 and a '1' representing any non-zero amount of benefits paid under the program. Version 45 of the NGIB Database, which contained VA data through May '87 and SMCR data through April '87 did not show any individuals with a first award under SREAP occurring in May, so no adjustment for this reason was required.

E. STATISTICAL METHODOLOGY

The point of this study is to show the effect SREAP has had upon retention in the SMCR. To that affect, logistic regression analysis was chosen as the statistical method to be used in demonstrating the effect accepting benefits under the program has had upon an individuals propensity to attrite from the SMCR.

1. The Dependent Variable

The dependent variable in each model would be 'loss'. Loss would indicate whether or not this study had considered this individual to be a valid voluntary attrite from the SMCR. A '1' would indicate a loss and a '0' would indicate that the individual was not considered to be a loss. Of those

individuals not eliminated from the working database extract (as described in section C of this chapter) those that would be considered as non-losses for the purposes of this study were: (1) those that were coded as File Type 'M's, indicating their presence on the RCCPDS Master file and, (2) those coded as File Type 'L', loss, or 'P', presumed loss, and (a) on active duty as of 30 April 1987, (b) in another branch of Selected Reserves as of 30 April 1987, (c) coded with Interservice Separation Codes '40' or '42' indicating entry into a commissioning program or service academy, respectively, or (d) coded with Separation Program Designators 'MGU' or 'KGN', indicating entry into a service academy, or commissioned or transferred to another branch, respectively. Any other record remaining in the extract for the purposes of that particular regression that was coded as File Type 'L' or 'P' and not described as above, was considered to be a voluntary loss.

2. The Logistic Multiple Regression Model

Because of the dichotomous nature of the dependent variable, a binary choice model to predict the likelihood that an individual would be a loss is appropriate. For this reason the logistic multiple regression model was chosen for use in the analysis.

The logit model is based on the cumulative logistic probability function. The model is specified as:

$$P_i = f(Z_i) = f(\alpha + \beta X_i) = \frac{1}{1 + e^{-Z_i}} = \frac{1}{1 + e^{-(\alpha + \beta X_i)}}$$

where e represents the base of natural logarithms, P_i is the probability an individual will make a particular choice, given the values of the independent variables X_i and the parameters α and β (to be estimated) [Ref. 28: 287]. In this study P_i would represent the probability that an individual would be an attrite, and the independent variable of most interest is the one representing acceptance of benefits under SREAP. The Logist Procedure, which is the

Statistical Analysis System's (SAS) version of the logit model, was used in the analysis [Ref. 29].

3. Models Tested

Four models were run in the course of this analysis. The first, second, and fourth models varied only in the selection criterion for inclusion of records in the analysis. The third model differed in that it eliminated one independent variable which had many missing values (AFQT). Also, each model was estimated with pay grade E1 personnel deleted, for reasons discussed below.

The first, second, and fourth models appeared as:

LOSS = f(GRADEE1+GRADEE2+GRADEE3+GRADEE4+GRADEE5+ CIVED4+CIVED56+CIVED9+CIVED20+CIVED21+FEMALE+BLACK+ HISPANIC+ASIANPAC+RACEOTHR+MARRIED+DIVORCED+AFQT+ BENSPAID);

where GRADEEX = Pay Grade, CIVEDX = Civilian Education Category, RACEOTHR = combination of American Indian/Alaska Native and Other Race/Ethnic Category, AFQT = AFQT Category, and BENSPAID = indicator of SREAP usage. The third model eliminated the AFQT independent variable. The reference individual resulting from the described model would be a Pay Grade E6, Civilian Education Category 15 (High school diploma), white, single, and not receiving SREAP benefits.

The records included in Model One were all E1 - E6 records as described in section C of this chapter with the appropriate Civilian Education Category, the selected Interservice Separation Codes and selected Separation Program Designators. Eliminated from Model One were those not described as above, as well as those coded as retired, AFQT unknown, or a voluntary loss (within the context of this study) from the SMCR prior to 30 September 1985. All losses after 30 September 1985 without explanatory codes

(Interservice Separation Codes, SPD's, Active, Other Selres) were included in this model as voluntary losses.

Model One (-E1) is the same as Model One, except Pay Grade E1 was eliminated from the analysis. E1's were eliminated since the possibility of their participation in SREAP was limited due to their short time in the SMCR, as well as their reduced possibility of becoming a voluntary loss (within the context of this study) for the same reason. Basic training losses of E1's were eliminated from the study by SPD Codes.

Model Two is the same as Model One, except that it included only those records with an Eligibility Status Code that indicated current eligibility (06 or 23) or eligibility terminated for: a) failure to participate (08), b) completing a bachelors degree (09), c) receiving an ROTC scholarship (10), or, d) separating from the SMCR (11, 24, or 25). Appropriate Eligibility Status adds the additional constraint that the individual has a 6 year SMCR commitment after 30 June 1985, and that his SMCR unit has updated his record in the NGIB Database with the correct Eligibility Status Code. Model Two (-E1) is the same as Model Two, minus E1's from the database and the regression equation.

Model Three is the same as Model One, except all records with AFQT unknown have been included and the independent variable AFQT has been removed from the regression. Model Three (-E1) is the same as Model Three, minus E1's.

Model Four is the same as Model One, except all records coded as File Type 'L' or 'P' that did not have an Interservice Separation Code or SPD, or were not coded as active duty or in another branch of Selected Reserves as 30 April 1987, were deleted. In other words, those records that are coded as losses from the SMCR, without any accompanying codes to indicate why they are losses, are eliminated. Model Four (-E1) is the same as Model Four without E1's.

IV. ANALYSIS

This chapter presents the results of the four logistic regression models presented in the last chapter. The primary purpose of the regressions and this analysis is to determine the impact accepting benefits under SREAP has upon an individual's propensity to voluntarily attrite from the SMCR.

A. SAS LOGIST OUTPUT

Each of the tables in this chapter and the appendix presents the logit estimates of the parameters of the associated model. The model chi-square is a statistic that provides a measure of the overall fit of the model, similar to an F-test for a multiple regression. A chi-square value of 36.19 or more, with 19 degrees of freedom, for example, indicates statistical significance at the 99 percent level.

The parameter estimates, labeled Beta in the tables, is given by:

$$\text{ßeta} = \frac{\partial \log(P/1-P)}{\partial X}$$, where P = the probability of the individual making a particular choice. The log of the odds transformation converts the probability estimates to a continuous unbounded variable. This variable then becomes the dependent variable in a linear model with the categorical definitions (pay grade, cived, benspaid, etc.) as explanatory (independent) variables.

The P-value indicates the significance of the Beta value of the associated independent variable, and is based on the chi-square statistic. (In this case the chi-square is equal to the square of a Z-score for the variable.). The lower the P-value, the higher the confidence level of the associated Beta. [Refs. 28;29] A blank P-value in the output tables indicates an extremely low value.

The purpose of these regressions is to demonstrate the effect accepting SREAP benefits (variable = benspaid) would have upon an individual's propensity to attrite, controlling for the effect of personal characteristics on attrition. The output of each primary model is presented in this chapter and the output of each model (less E1's) appears in the Appendix.

B. MODEL ONE

Model One analyzes 38,141 records, of which 9368 (24.6%) records are coded as losses in accordance with criterion set forth in the previous chapter. There are 2095 SREAP users in the sample of which 56 (2.67%) are losses and 2039 (97.35%) are non-losses. The SREAP users represent 0.6% of the losses and 7.09% of the non-losses. Among the non-SREAP users, 9312 (25.83%) are losses and 26734 (74.17%) are non-losses. (It is important to note that this model contains 6277 records with dates of separation after 30 September 1985 that are coded as losses but do not contain other explanatory codes (Interservice Separation Codes, SPD's, Active, Other Selres).

As shown in Table 4, Model One has a chi-square of 3720 with 19 degrees of freedom, which is highly significant. The chi-square for the Beta value of the SREAP coefficient (benspaid) is 294, which is also highly significant.

The marginal effectiveness of the acceptance of SREAP benefits on the probability of an individual being a loss is calculated as:

$$\frac{\partial P}{\partial X} = \beta P(1-P) = -.4376$$

where β = the estimated coefficient (-2.359), X = independent variable (benspaid), and P = the probability of being a loss (.246). This 43.76% marginal effectiveness means that a 10% increase in the number of individuals accepting SREAP benefits in this sample (210 individuals) should reduce the number categorized as losses by 92 individuals for this sample.

TABLE 4
MODEL ONE REGRESSION RESULTS

SAS

LOGISTIC REGRESSION PROCEDURE
MODEL ONE

DEPENDENT VARIABLE: LOSS

38141 OBSERVATIONS
28773 LOSS = 0
9368 LOSS = 1
0 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	BETA	STD. ERROR	CHI-SQUARE	P	R
INTERCEPT	-1.69403853	0.10563353	257.18	.	
GRADEE1	0.29028752	0.09734973	8.89	0.0029	0.013
GRADEE2	-0.09008755	0.09511635	0.90	0.3436	0.000
GRADEE3	0.31297037	0.09115049	11.79	0.0006	0.015
GRADEE4	0.85089366	0.08959344	90.20	.	0.046
GRADEE5	1.05517068	0.09073303	135.24	.	0.056
CIVED4	1.46022596	0.07126745	419.81	.	0.099
CIVED56	-0.92572482	0.06674976	192.34	.	-0.067
CIVED9	-0.97378218	0.11901050	66.95	0.0000	-0.039
CIVED20	-1.47960237	0.43655300	11.49	0.0007	-0.015
CIVED21	-0.22611535	0.10827443	4.36	0.0368	-0.007
FEMALE	0.02825164	0.06901005	0.18	0.6687	0.000
BLACK	0.08280856	0.03258815	6.46	0.0111	0.010
HISPANIC	-0.18661329	0.05332833	12.25	0.0005	-0.016
ASIANPAC	-0.24815276	0.10971079	5.12	0.0237	-0.009
RACEOTHR	-0.07199258	0.09009099	0.64	0.4242	0.000
MARRIED	0.27029214	0.03181518	72.18	0.0000	0.041
DIVORCED	1.92105129	0.06900444	775.04	.	0.135
AFQT	-0.00094739	0.00750884	0.02	0.8996	0.000
SENSPAID	-2.35902537	0.13759851	293.93	.	-0.083

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY=42524.64

MODEL CHI-SQUARE= 3631.60 WITH 19 D.F. (SCORE STAT.) P=0.0 .
CONVERGENCE IN 7 ITERATIONS WITH 0 STEP HALVINGS R= 0.294.
MAX ABSOLUTE DERIVATIVE=0.1092D-06. -2 LOG L=38804.38.
MODEL CHI-SQUARE= 3720.26 WITH 19 D.F. (-2 LOG L.R.) P=0.0 .

As evidenced by their Beta values and respective chi-squares, several other factors in these models appear to have a significant effect on an individual's probability of being a loss. Because they are more likely to have completed their enlistment contract, persons in the two senior pay grades, E4 and E5, are significantly more likely to be a loss. E1 and E3's are also more

likely to be losses than E2 or E6's. An individual with a test-based equivalency diploma/GED (cived 4) is far more likely to be a loss than his peers who possess qualifying educational certifications other than GED's, especially those who have completed a year of college (cived 20), who have a distinctly higher retention probability. Hispanics and Asians are less likely to be losses than blacks or whites. No longer married (divorced) individuals are far more likely to be losses than their single counterparts, while those still married are also more likely to attrite.

C. MODEL TWO

Model Two analyzes 7695 records, of which 251 (3.26%) records are coded as losses. There are 1560 SREAP users in the sample of whom 30 (1.92%) are losses and 2039 (98.08%) are non-losses. The SREAP users represent 11.95% of the losses and 20.55% of the non-losses. Among the non-SREAP users, 221 (3.6%) are losses and 5914 (96.4%) are non-losses.

The sample size of Model Two was reduced significantly from that of Model one (7695 down from 38,141) by the additional selection criterion of the appropriate Eligibility Status Code. The difference between the sample used in Model One and that used in Model Two should have been that the individuals included in Model Two had obligated themselves to a six-year SMCR term after 30 June 1985. As expected, this model greatly biased the sample in terms of the large percentage of SREAP users (20.3% vs. 5.5% in Model One) since establishing eligibility for SREAP would be a primary reason for signing a six year obligation. These individuals would also be more likely to ascertain that their administrative section had entered the correct Eligibility Status Code in their records for NGIB purposes.

One would also expect to find fewer losses as a percentage of the sample in Model Two, since, presumably, the sample population had obligated itself to six-year terms for the purpose of using SREAP benefits. Only 3.3% of the

sample in this model were coded as losses as compared to 24.6% in the previous sample. The results of estimating Model Two are shown in Table 5.

TABLE 5
MODEL TWO REGRESSION RESULTS

SAS

LOGISTIC REGRESSION PROCEDURE
MODEL TWO

DEPENDENT VARIABLE: LOSS

7695 OBSERVATIONS
7444 LOSS = 0
251 LOSS = 1
0 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	BETA	STD. ERROR	CHI-SQUARE	P	R
INTERCEPT	-3.39104379	0.54650598	38.50	0.0000	
GRADEE1	-0.06045895	0.41876874	0.02	0.8852	0.000
GRADEE2	-1.12480553	0.39130797	8.26	0.0040	-0.053
GRADEE3	-1.19067451	0.39596188	9.04	0.0026	-0.056
GRADEE4	-0.37787823	0.48864089	0.60	0.4393	0.000
GRADEE5	0.10237215	0.38742825	0.07	0.7916	0.000
CIVED4	-0.17128839	0.77188346	0.05	0.8244	0.000
CIVED56	-0.82635930	0.45119582	3.35	0.0671	-0.025
CIVED9	0.10829364	0.37400820	0.08	0.7722	0.000
CIVED20	-6.69580099	21.16812866	0.10	0.7518	0.000
CIVED21	-0.15256754	0.62132318	0.06	0.8060	0.000
FEMALE	-0.50985808	0.41720190	1.49	0.2217	0.000
BLACK	0.37567742	0.16773681	5.02	0.0251	0.037
HISPANIC	-0.01773172	0.31282316	0.00	0.9548	0.000
ASIANPAC	-0.08103037	0.53898410	0.02	0.8805	0.000
RACEOTHR	-0.77206071	0.61652050	1.57	0.2105	0.000
MARRIED	0.45703987	0.21608702	4.47	0.0344	0.033
DIVORCED	2.95934605	0.23124215	163.78	.	0.270
AFQT	0.09349684	0.04882050	3.67	0.0555	0.027
BENSPAID	-0.67948143	0.22117863	9.44	0.0021	-0.058

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY= 2212.00

MODEL CHI-SQUARE= 480.51 WITH 19 D.F. (SCORE STAT.) P=0.0 .
CONVERGENCE IN 9 ITERATIONS WITH 1 STEP HALVINGS R= 0.298.
MAX ABSOLUTE DERIVATIVE=0.1958D-01. -2 LOG L= 1977.44.
MODEL CHI-SQUARE= 234.57 WITH 19 D.F. (-2 LOG L.R.) P=0.0 .

As in the first model, benspaid has a significant negative effect on the loss probability. The marginal effectiveness of the acceptance of SREAP

benefits in Model Two on the probability of an individual being a loss is -.0214. This means that a 10% increase (156) in SREAP users would result in a decrease of 3 losses for this sample. This small decrease in the number of losses was expected because of the small base number of losses in this sample. Unlike the previous model, civilian education was not statistically significant in Model Two, while AFQT approached significance.

As noted earlier, most of the individuals included in this sample have signed six-year SMCR obligations specifically to take advantage of SREAP. Therefore, a considerably lower loss rate would be expected among this group, as would be the smaller marginal retention effectiveness by the actual acceptance of SREAP benefits. The creation of an "eligible group" that has a loss rate of only 3.3%, even though only one-fifth of the group have actually used benefits, is a clear demonstration that SREAP increases retention.

D. MODEL THREE

Model Three analyzes 47,050 records, of which 11,703 (24.87%) records are coded as losses. There are 2409 SREAP users in the sample of whom 67 (2.78%) are losses and 2342 (97.22%) are non-losses. The SREAP users represent 0.57% of the losses and 6.63% of the non-losses. Among the non-SREAP users, 11,636 (26.07%) are losses and 33,005 (73.93%) are non-losses.

Model Three's sample size is increased 23% (47,050 up from 38,141) over that used in Model One because of the inclusion of 8909 individuals with AFQT unknown records. With the inclusion of AFQT unknown records, which are coded as 0 in the database, AFQT as an independent variable was dropped from the regression. Other variables in the Model retained approximately the same relative significance level as in Model One, with slight added significance and a sign change for female .

TABLE 6
MODEL THREE REGRESSION RESULTS

SAS

LOGISTIC REGRESSION PROCEDURE
MODEL THREE

DEPENDENT VARIABLE: LOSS

47050 OBSERVATIONS
35347 LOSS = 0
11703 LOSS = 1
0 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	BETA	STD. ERROR	CHI-SQUARE	P	R
INTERCEPT	-1.74382240	0.05737803	923.66	.	
GRADEE1	0.35127833	0.06954916	26.26	0.0000	0.021
GRADEE2	0.00625805	0.06552987	0.01	0.9239	0.000
GRADEE3	0.38186183	0.06001151	40.49	0.0000	0.027
GRADEE4	0.90073357	0.05749829	245.40	.	0.068
GRADEE5	0.94189726	0.05725873	270.60	.	0.071
CIVED4	1.33127112	0.06246411	454.23	.	0.093
CIVED56	-0.96722633	0.05492141	310.15	.	-0.076
CIVED9	-0.90890884	0.11384883	63.74	0.0000	-0.034
CIVED20	-1.07003611	0.28144038	14.46	0.0001	-0.015
CIVED21	-0.25619272	0.08014500	10.22	0.0014	-0.012
FEMALE	-0.12664518	0.05379013	5.54	0.0186	-0.008
BLACK	0.07448088	0.02822716	6.96	0.0083	0.010
HISPANIC	-0.13711801	0.04708565	8.48	0.0036	-0.011
ASIANPAC	-0.22805723	0.09632520	5.61	0.0179	-0.008
RACEOTHR	-0.05110638	0.07762229	0.43	0.5103	0.000
MARRIED	0.27661653	0.02729631	102.69	.	0.044
DIVORCED	1.56491939	0.05426523	831.65	.	0.125
BENSPAID	-2.32836734	0.12552564	344.06	.	-0.081

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY=52784.60

MODEL CHI-SQUARE= 3825.37 WITH 18 D.F. (SCORE STAT.) P=0.0 .
CONVERGENCE IN 7 ITERATIONS WITH 0 STEP HALVINGS R= 0.274.
MAX ABSOLUTE DERIVATIVE=0.8692D-08. -2 LOG L=48787.30.
MODEL CHI-SQUARE= 3997.30 WITH 18 D.F. (-2 LOG L.R.) P=0.0 .

As in the previous models, benspaid has a significant negative effect on the loss probability. The marginal effectiveness of the acceptance of SREAP benefits in Model Three on the probability of an individual being a loss is -.4351. This means that a 10% increase (241) in SREAP users would result

in a decrease of 105 losses. This marginal effectiveness of 43.51% is almost the same as the effectiveness calculated for Model One.

E. MODEL FOUR

Model Four analyzes 31,864 records, of which 3091 (9.7%) records are coded as losses in accordance with criterion set forth in the previous chapter. There are 2044 SREAP users in the sample of which 5 (0.24%) are losses and 2039 (99.76%) are non-losses. The SREAP users represent 0.16% of the losses and 7.09% of the non-losses. Among the non-SREAP users, 3086 (10.35%) are losses and 26,734 (89.65%) are non-losses.

Model Four presents what could be considered the "cleanest" form of loss data in this study by eliminating those individuals who are coded as losses from the SMCR without any accompanying codes to indicate why they are losses. Using the same base criterion for selection as Model One, the sample was cut by 6277 records that were considered to be voluntary losses in Model One.

Benspaid in Model Four, as in the previous models, has a significant negative effect on loss probability. The marginal effectiveness of the acceptance of SREAP benefits in Model Four on the probability of an individual being a loss is -.3181. This means that a 10% increase (204) in SREAP users would result in a decrease of 65 losses. Even at this greatly reduced level of loss records and ensuing sample bias, the marginal effectiveness of SREAP is quite large.

TABLE 7
MODEL FOUR REGRESSION RESULTS

SAS

LOGISTIC REGRESSION PROCEDURE
MODEL FOUR

DEPENDENT VARIABLE: LOSS

31864 OBSERVATIONS
28773 LOSS = 0
3091 LOSS = 1
0 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	BETA	STD. ERROR	CHI-SQUARE	P	R
INTERCEPT	-3.16060324	0.17145480	339.81	.	
GRADEE1	0.51611902	0.15460761	11.14	0.0008	0.021
GRADEE2	0.36005022	0.15008269	5.76	0.0164	0.014
GRADEE3	0.32591280	0.14673268	4.93	0.0263	0.012
GRADEE4	0.73018630	0.14417585	25.65	0.0000	0.034
GRADEE5	1.27793401	0.14396553	78.80	.	0.062
CIVED4	1.65702507	0.09050752	335.19	.	0.128
CIVED56	-1.27266393	0.12858118	97.97	.	-0.069
CIVED9	-0.79694241	0.18040331	19.51	0.0000	-0.029
CIVED20	-2.21020566	1.01227490	4.77	0.0290	-0.012
CIVED21	-0.21037844	0.16922040	1.55	0.2138	0.000
FEMALE	-0.13735062	0.10633900	1.67	0.1965	0.000
BLACK	0.21603004	0.05019200	18.53	0.0000	0.029
HISPANIC	0.09066481	0.07714700	1.38	0.2399	0.000
ASIANPAC	-0.08417415	0.16834808	0.25	0.6171	0.000
RACEOTHR	0.15018502	0.13140731	1.31	0.2531	0.000
MARRIED	0.26541452	0.04852686	56.70	0.0000	0.052
DIVORCED	1.59468608	0.09939425	257.41	.	0.112
AFQT	0.02724416	0.01233846	4.88	0.0272	0.012
BENSPAID	-3.63144511	0.44882063	65.47	0.0000	-0.056

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY=20294.46

MODEL CHI-SQUARE= 1760.15 WITH 19 D.F. (SCORE STAT.) P=0.0 .
CONVERGENCE IN 8 ITERATIONS WITH 0 STEP HALVINGS R= 0.276.
MAX ABSOLUTE DERIVATIVE=0.6121D-04. -2 LOG L=18715.71.
MODEL CHI-SQUARE= 1578.74 WITH 19 D.F. (-2 LOG L.R.) P=0.0 .

F. ANALYSIS SUMMARY

The different models analyzed in this chapter have clearly demonstrated that SREAP has had a negative impact on an individual's propensity to be a loss in each the associated samples. The similarity of marginal retention

effectiveness of Models One and Three, despite a 23% difference in sample size, encourages confidence in the analysis' results. Model Two's loss rate of 3.3% versus a general sample loss rate of about 25%, points to the significant retention differences between those individuals who had established eligibility for SREAP and those who hadn't. Even after the elimination of two-thirds of the records that were coded as losses (Model One to Model Four) the positive impact of SREAP on retention remained highly significant.

To further test the impact of AFQT on the model, Models One, Two, and Four were run without the AFQT variable. Each of these models without AFQT did not produce a significant change in computed Beta values and chi-squares of the other variables. The results appear as the last three pages of the Appendix.

The impact of the marginal effects of SREAP on retention that were developed from the models in this chapter will be put into a broader perspective in the following chapter.

V. CONCLUSIONS

In this chapter the statistical analysis of the previous chapter is placed in a real world perspective through an examination of SREAP's effect on retention in the SMCR from a financial standpoint.

A. CURRENT SMCR ATTRITION

Preliminary Marine Corps studies of SMCR attrition rates between 1980 and 1986 have estimated that after 2.75 years of service, only 65% of the non-prior service enlistees and 28% of the prior service joins remain in the SMCR. By 6.75 years only an estimated 4% of the non-prior service individuals remain.

The analysis of the NGIB Database used in this study showed a 24% "voluntary" loss rate among pay grade E1 - E6's who had SREAP eligible civilian education certification. This rate was calculated over a 19 month period that ran from SMCR publication of SREAP eligibility rules in ALMAR 222/85 [Ref. 27] on 30 September 1985 to the end of the period covered by NGIB Database Version 45 on 30 April 1987. This loss rate does not include those who transferred to other branches of Selected Reserves, were on active duty as of 30 April 1987, or had retired. If losses that were not considered to be voluntary (medical, disciplinary, etc.) were included in this study, that loss rate would be over 30%. This figure is comparable to the above CNA figure of an estimated 65% remaining after 2.75 years.

The obvious results of these kind of turnover statistics include a lack of force continuity and the destabilizing effects that accompany such manpower instability, as well as the high expense of replacing individuals in the SMCR.

B. ESTIMATE OF SREAP ATTRITION SAVINGS

A June 1986 Center for Naval Analyses (CNA) study [Ref. 30] determined the 1985 attrition costs for individuals in the Marine Corps to be between $2,194 and $6,908 per contract. Marine Corps estimates for 1987 enlisted replacement costs run as high as $8500.

In Model Three of this study the 2409 SREAP participants had used a total of $2,111,067 in benefits, ranging from $23 to $3468 per individual. The 2095 SREAP users of Model One had used $1,788,129 over the same individual payment range. The average benefit paid in Model Three is $876 and an average of $853 is calculated in Model One. Using an average of the high and low 1985 CNA attrition cost figures ($4551) and the 43% marginal retention effectiveness of SREAP calculated for those two models, an $876 investment in a individual's education by the Marine Corps results in a $1957 savings in attrition costs, for a total savings to the Marine Corps of $1081 per individual.

C. SUMMARY

The $1081 savings per individual (at the 30 April 1987 levels) occurs among the group of individuals the Marine Corps is most interested in retaining, as defined by their current educational levels and their obvious desire for self-improvement through education (evidenced by their enrollment in SREAP). Though beyond the scope of this study, the benefits to the individuals themselves through government investment in the individual's human capital would certainly be considerable.

As of 30 April 1987 the SREAP program had only existed for 22 months. As the program matures, individuals will begin to reach the maximum $5040 in benefits (36 months full-time study at $140/month). The effect this higher range of payments (as compared to the current high of $3468) will have on average benefits paid will depend on the number of new

SREAP users the SMCR recruits as the program matures. As attrition costs per individual continue to rise with inflation, the difference between the average payments under SREAP and attrition costs will probably continue to result in a significant savings to the Marine Corps, even with a rising average payment under the plan.

As individuals who are recruited specifically to take advantage of SREAP benefits increase as a percentage of the SMCR population, the results should include a better educated, more stable force with a significantly lower attrition rate than was found in the SMCR pre-SREAP. As evidenced by the sample that was selected for Model Two and its 3.3% loss rate, as more of the force becomes eligible for SREAP the loss rate among the force population should continue to decrease considerably.

RCCPDS data show that average SMCR enlisted pay grade, which remained constant at E3.4 for FY's 79 - 84, rose to E3.5 for FY's 85 and 86 and to E3.6 during the first six months of FY87. This compares to a Naval Reserve enlisted pay grade average of E4.8 for FY's 79 - 84 and E4.4 for FY's 85 - 87. Six year contracts, as a percentage of the different lengths of contracts signed (3, 4, 5, and 6 years), rose from 69.7% in FY85, to 83% in FY86. In the first three months of FY87, 87.7% of contracts signed were six year contracts.

All of this analysis points to SREAP as a cost effective, successful program in terms of its impact on SMCR retention. As the program becomes more popular and better publicized, even better performance in the area of retention may be expected.

APPENDIX

MODELS WITHOUT E1's AND MODELS ONE, TWO, AND FOUR WITHOUT AFQT, LOGIST REGRESSION RESULTS

This appendix contains the SAS logist results for the four regression models outlined in Chapter III, less pay grade E1 records, and Models One, Two, and Four without AFQT.

MODEL ONE (-E1) REGRESSION RESULTS

SAS

LOGISTIC REGRESSION PROCEDURE
MODEL ONE (-E1)

DEPENDENT VARIABLE: LOSS

34259 OBSERVATIONS
25670 LOSS = 0
8589 LOSS = 1
0 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	BETA	STD. ERROR	CHI-SQUARE	P	R
INTERCEPT	-1.55792216	0.10643208	214.26	.	
GRADEE2	-0.09936870	0.09516525	1.09	0.2964	0.000
GRADEE3	0.30141505	0.09117919	10.93	0.0009	0.015
GRADEE4	0.84234893	0.08960316	88.38	.	0.047
GRADEE5	1.05111301	0.09071174	134.27	.	0.059
CIVED4	1.44517913	0.07265610	395.64	.	0.101
CIVED56	-0.96482637	0.06840312	198.95	.	-0.071
CIVED9	-0.91913087	0.13284758	47.87	0.0000	-0.034
CIVED20	-1.38072812	0.43925589	9.88	0.0017	-0.014
CIVED21	-0.21980545	0.10878303	4.08	0.0433	-0.007
FEMALE	0.01822041	0.06770222	0.07	0.7878	0.000
BLACK	0.04292066	0.03447857	1.55	0.2132	0.000
HISPANIC	-0.19831712	0.05564803	12.70	0.0004	-0.017
ASIANPAC	-0.29881941	0.11501069	6.75	0.0094	-0.011
RACEOTHR	-0.06599089	0.09490545	0.48	0.4868	0.000
MARRIED	0.25758586	0.03247057	62.83	0.0000	0.040
DIVORCED	1.87197113	0.07122068	690.78	.	0.134
AFQT	-0.01615683	0.00772449	4.37	0.0365	-0.008
BENSPAID	-2.33910828	0.13759450	289.00	.	-0.086

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY=38583.27

MODEL CHI-SQUARE= 3398.40 WITH 18 D.F. (SCORE STAT.) P=0.0 .
CONVERGENCE IN 7 ITERATIONS WITH 0 STEP HALVINGS R= 0.301.
MAX ABSOLUTE DERIVATIVE=0.1202D-06. -2 LOG L=35047.19.
MODEL CHI-SQUARE= 3536.08 WITH 18 D.F. (-2 LOG L.R.) P=0.0 .

MODEL TWO (-E1) REGRESSION RESULTS

SAS

LOGISTIC REGRESSION PROCEDURE
MODEL TWO (-E1)

DEPENDENT VARIABLE: LOSS

7181 OBSERVATIONS
6966 LOSS = 0
215 LOSS = 1
0 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	BETA	STD. ERROR	CHI-SQUARE	P	R
INTERCEPT	-3.27444985	0.56824835	33.20	0.0000	
GRADEE2	-1.13022882	0.39426295	8.22	0.0041	-0.057
GRADEE3	-1.20215390	0.39858508	9.10	0.0026	-0.061
GRADEE4	-0.39280428	0.49108331	0.64	0.4238	0.000
GRADEE5	0.09137658	0.38839601	0.06	0.8140	0.000
CIVED4	-0.15291065	0.77795131	0.04	0.8442	0.000
CIVED56	-1.02507911	0.48947360	4.39	0.0362	-0.035
CIVED9	-0.01632292	0.46738716	0.00	0.9721	0.000
CIVED20	-7.30734255	.	.	.	.
CIVED21	-0.08223444	0.62307851	0.02	0.8950	0.000
FEMALE	-0.57579719	0.45249308	1.62	0.2032	0.000
BLACK	0.43886266	0.17968878	5.97	0.0146	0.045
HISPANIC	-0.23710184	0.37395489	0.40	0.5261	0.000
ASIANPAC	0.05612411	0.54261694	0.01	0.9176	0.000
RACEOTHR	-1.04908778	0.75438376	1.93	0.1643	0.000
MARRIED	0.45826489	0.22537904	4.13	0.0420	0.033
DIVORCED	2.96414083	0.24322459	148.52	.	0.275
AFQT	0.07904279	0.05255045	2.26	0.1325	0.012
BENGPAID	-0.64176893	0.22242019	8.33	0.0039	-0.057

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY= 1932.18

MODEL CHI-SQUARE= 444.73 WITH 18 D.F. (SCORE STAT.) P=0.0 .

NOTE: VARIABLE CIVED20 HAS BETA=-0.73073D+01 S.E.= 0.17340D+02 IN ITERATION 9.
BETA IS ASSUMED TO BE INFINITE.
CONVERGENCE IN 10 ITERATIONS WITH 1 STEP HALVINGS R= 0.296.
MAX ABSOLUTE DERIVATIVE=0.1072D-01. -2 LOG L= 1726.85.
MODEL CHI-SQUARE= 205.33 WITH 18 D.F. (-2 LOG L.R.) P=0.0 .

MODEL THREE (-E1) REGRESSION RESULTS

SAS

LOGISTIC REGRESSION PROCEDURE
MODEL THREE (-E1)

DEPENDENT VARIABLE: LOSS

42982 OBSERVATIONS
32100 LOSS = 0
10882 LOSS = 1
0 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	BETA	STD. ERROR	CHI-SQUARE	P	R
INTERCEPT	-1.72273014	0.05751257	897.24	.	
GRADEE2	-0.00699392	0.06557953	0.01	0.9151	0.000
GRADEE3	0.37013673	0.06004766	38.00	0.0000	0.027
GRADEE4	0.89054447	0.05750642	239.82	.	0.070
GRADEE5	0.93650598	0.05722799	267.80	.	0.074
CIVED4	1.31485512	0.06337865	430.40	.	0.094
CIVED56	-1.00413001	0.05593495	322.27	.	-0.081
CIVED9	-0.86521887	0.12760115	45.98	0.0000	-0.030
CIVED20	-1.01724720	0.28266492	12.95	0.0003	-0.015
CIVED21	-0.25533626	0.08032744	10.10	0.0015	-0.013
FEMALE	-0.14284731	0.05477927	6.80	0.0091	-0.010
BLACK	0.05113316	0.02959821	2.98	0.0841	0.004
HISPANIC	-0.13251714	0.04876589	7.38	0.0066	-0.011
ASIANPAC	-0.26329518	0.09990874	6.95	0.0084	-0.010
RACECTHR	-0.04011601	0.08082352	0.25	0.6197	0.000
MARRIED	0.26745721	0.02772210	93.08	.	0.043
DIVORCED	1.52084224	0.05551006	750.63	.	0.124
BENSPAID	-2.31997920	0.12553582	341.53	.	-0.084

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY=48638.19

MODEL CHI-SQUARE= 3802.20 WITH 17 D.F. (SCORE STAT.) P=0.0 .
CONVERGENCE IN 7 ITERATIONS WITH 0 STEP HALVINGS R= 0.279.
MAX ABSOLUTE DERIVATIVE=0.9383D-08. -2 LOG L=44819.53.
MODEL CHI-SQUARE= 3818.66 WITH 17 D.F. (-2 LOG L.R.) P=0.0 .

MODEL FOUR (-E1) REGRESSION RESULTS

SAS

LOGISTIC REGRESSION PROCEDURE
MODEL FOUR (-E1)

DEPENDENT VARIABLE: LOSS

28466 OBSERVATIONS
25670 LOSS = 0
2796 LOSS = 1
0 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	BETA	STD. ERROR	CHI-SQUARE	P	R
INTERCEPT	-3.06265362	0.17330777	312.29	.	
GRADEE2	0.32893612	0.15017580	4.80	0.0285	0.012
GRADEE3	0.29383717	0.14679337	4.01	0.0453	0.010
GRADEE4	0.70178822	0.14419098	23.69	0.0000	0.034
GRADEE5	1.26107804	0.14390884	76.79	.	0.064
CIVED4	1.62884640	0.09226647	315.49	.	0.131
CIVED56	-1.41520663	0.13823258	104.66	.	-0.075
CIVED9	-1.00850869	0.22963734	19.29	0.0000	-0.031
CIVED20	-2.10021520	1.01275507	4.30	0.0381	-0.011
CIVED21	-0.22227864	0.17064309	1.70	0.1927	0.000
FEMALE	-0.14600332	0.10935158	1.78	0.1818	0.000
BLACK	0.17475132	0.05336247	10.72	0.0011	0.022
HISPANIC	0.07013869	0.08115492	0.75	0.3874	0.000
ASIANPAC	-0.12572027	0.17688210	0.51	0.4772	0.000
RACEOTHR	0.20875407	0.13617890	2.35	0.1253	0.004
MARRIED	0.33736656	0.04967361	46.13	0.0000	0.049
DIVORCED	1.39263686	0.10762796	167.43	.	0.095
AFQT	0.02185677	0.01273829	2.93	0.0869	0.007
BENSPAID	-3.61950409	0.44880228	65.04	0.0000	-0.059

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY=18284.26

MODEL CHI-SQUARE= 1603.78 WITH 18 D.F. (SCORE STAT.) P=0.0 .
CONVERGENCE IN 8 ITERATIONS WITH 0 STEP HALVINGS R= 0.282.
MAX ABSOLUTE DERIVATIVE=0.5774D-04. -2 LOG L=16791.91.
MODEL CHI-SQUARE= 1492.35 WITH 18 D.F. (-2 LOG L.R.) P=0.0 .

MODEL ONE WITHOUT AFQT

SAS

LOGISTIC REGRESSION PROCEDURE
MODEL ONE WITHOUT AFQT

DEPENDENT VARIABLE: LOSS

38141 OBSERVATIONS
28773 LOSS = 0
9368 LOSS = 1
0 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	BETA	STD. ERROR	CHI-SQUARE	P	R
INTERCEPT	-1.70109420	0.08962322	360.26	.	
GRADEE1	0.28997433	0.09731748	8.88	0.0029	0.013
GRADEE2	-0.09042232	0.09537876	0.90	0.3416	0.000
GRADEE3	0.31288711	0.09114761	11.78	0.0006	0.015
GRADEE4	0.85072600	0.08958301	90.18	.	0.046
GRADEE5	1.05497071	0.09071849	135.24	.	0.056
CIVED4	1.46021575	0.07126677	419.82	.	0.099
CIVED56	-0.92645271	0.06650044	194.09	.	-0.067
CIVED9	-0.97328038	0.11894345	66.96	0.0000	-0.039
CIVED20	-1.48038628	0.43650295	11.50	0.0007	-0.015
CIVED21	-0.22645437	0.10823997	4.38	0.0364	-0.007
FEMALE	0.02767915	0.06585404	0.18	0.6743	0.000
BLACK	0.38376367	0.03169688	6.98	0.0082	0.011
HISPANIC	-0.18588456	0.05301463	12.29	0.0005	-0.016
ASIANPAC	-0.24792175	0.10969785	5.11	0.0238	-0.009
RACEOTHR	-0.07144210	0.08998395	0.63	0.4272	0.000
MARRIED	0.27046236	0.03178663	72.40	0.0000	0.041
DIVORCED	1.92118696	0.06899600	775.34	.	0.135
BENSPAID	-2.35961061	0.13752115	294.40	.	-0.083

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY=42524.64

MODEL CHI-SQUARE= 3631.50 WITH 18 D.F. (SCORE STAT.) P=0.0 .
CONVERGENCE IN 7 ITERATIONS WITH 0 STEP HALVINGS R= 0.294.
MAX ABSOLUTE DERIVATIVE=0.1366D-07. -2 LOG L=38804.39.
MODEL CHI-SQUARE= 3720.24 WITH 18 D.F. (-2 LOG L.R.) P=0.0 .

MODEL TWO WITHOUT AFQT

SAS

LOGISTIC REGRESSION PROCEDURE
MODEL TWO WITHOUT AFQT

DEPENDENT VARIABLE: LOSS

7695 OBSERVATIONS
7444 LOSS = 0
251 LOSS = 1
0 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	BETA	STD. ERROR	CHI-SQUARE	P	R
INTERCEPT	-2.66847807	0.39040252	46.72	0.0000	
GRADE1	-0.07124064	0.41941115	0.03	0.8651	0.000
GRADE2	-1.10669022	0.39213605	7.96	0.0048	-0.052
GRADE3	-1.17094514	0.39668220	8.71	0.0032	-0.055
GRADE4	-0.36104146	0.48931511	0.54	0.4606	0.000
GRADE5	0.09244752	0.38814148	0.06	0.8117	0.000
CIVED4	-0.15844359	0.77387603	0.04	0.8378	0.000
CIVED56	-0.79468666	0.45259892	3.08	0.0791	-0.022
CIVED9	0.07287910	0.37281504	0.04	0.8450	0.000
CIVED20	-6.63053244	21.30256226	0.10	0.7556	0.000
CIVED21	-0.12245041	0.62013708	0.04	0.8435	0.000
FEMALE	-0.44387049	0.41687943	1.13	0.2870	0.000
BLACK	0.27221630	0.15865560	2.94	0.0862	0.021
HISPANIC	-0.09911001	0.30964039	0.10	0.7489	0.000
ASIANPAC	-0.09164952	0.53581007	0.03	0.8642	0.000
RACEOTHR	-0.82826034	0.62008312	1.78	0.1816	0.000
MARRIED	0.43969858	0.21584321	4.13	0.0421	0.031
DIVORCED	2.94458193	0.23148513	161.81	.	0.269
BENSPAID	-0.62913572	0.21957096	3.21	0.0042	-0.053

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY= 2212.00

MODEL CHI-SQUARE= 477.75 WITH 18 D.F. (SCORE STAT.) P=0.0 .
CONVERGENCE IN 9 ITERATIONS WITH 1 STEP HALVINGS R= 0.297.
MAX ABSOLUTE DERIVATIVE=0.22305D-02. -2 LOG L= 1981.12.
MODEL CHI-SQUARE= 230.88 WITH 18 D.F. (-2 LOG L.R.) P=0.0 .

MODEL FOUR WITHOUT AFQT

SAS

LOGISTIC REGRESSION PROCEDURE
MODEL FOUR WITHOUT AFQT

DEPENDENT VARIABLE: LOSS

31864 OBSERVATIONS
28773 LOSS = 0
3091 LOSS = 1
0 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	BETA	STD. ERROR	CHI-SQUARE	P	R
INTERCEPT	-2.95617962	0.14396436	421.65	.	
GRADEE1	0.52241063	0.15461744	11.42	0.0007	0.022
GRADEE2	0.36884940	0.15007011	6.04	0.0140	0.014
GRADEE3	0.32861253	0.14675933	5.01	0.0251	0.012
GRADEE4	0.73477791	0.14419536	25.97	0.0000	0.034
GRADEE5	1.28304580	0.14398704	79.40	.	0.062
CIVED4	1.65739567	0.09049091	335.46	.	0.128
CIVED56	-1.25141708	0.12820562	95.28	.	-0.068
CIVED9	-0.81025991	0.18029613	20.20	0.0000	-0.030
CIVED20	-2.18871631	1.01247878	4.67	0.0306	-0.011
CIVED21	-0.19938376	0.16924812	1.39	0.2388	0.000
FEMALE	-0.11902495	0.10599821	1.26	0.2615	0.000
BLACK	0.18745663	0.04847153	14.96	0.0001	0.025
HISPANIC	0.06970681	0.07654643	0.83	0.3625	0.000
ASIANPAC	-0.09157970	0.16829131	0.30	0.5863	0.000
RACEOTHR	0.13547475	0.13125547	1.07	0.3020	0.000
MARRIED	0.36103069	0.04847081	55.48	0.0000	0.051
DIVORCED	1.58710581	0.09931520	255.38	.	0.112
BENSPAID	-3.61463939	0.44874566	64.88	0.0000	-0.050

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY=20294.46

MODEL CHI-SQUARE= 1756.22 WITH 18 D.F. (SCORE STAT.) P=0.0 .
CONVERGENCE IN 3 ITERATIONS WITH 0 STEP HALVINGS R= 0.275.
MAX ABSOLUTE DERIVATIVE=0.7563D-05. -2 LOG L=18720.63.
MODEL CHI-SQUARE= 1573.82 WITH 18 D.F. (-2 LOG L.R.) P=0.0 .

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